

**Remarks**

Entry of the above-noted amendments, reconsideration of the application, and allowance of all claims pending are respectfully requested. By this amendment, claims 1-3, 5, 8, 10-11, 24-26, 28 are amended and claims 29-32 are added. These amendments to the claims constitute a bona fide attempt by applicant to advance prosecution of the application and obtain allowance of certain claims, and are in no way meant to acquiesce to the substance of the rejections. Support for the amendments can be found throughout the specification, figures, and claims (e.g., claims 6-9 and 17-20) and thus, no new matter has been added. Claims 1-32 are pending.

**Allowable Subject Matter:**

Claims 6-9 were objected to as being dependent upon rejected base claim 1, but were indicated as allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and if the double patenting rejection were overcome, discussed below. Applicant gratefully acknowledges this indication of allowability, and is merely deferring the rewriting of claims 6-9 in independent form, pending a determination of patentability of base claim 1.

Claims 17-20 were objected to as being dependent upon rejected base claim 10, but were indicated as allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and if the double patenting rejection were overcome, discussed below. Applicant gratefully acknowledges this indication of allowability, and is merely deferring the rewriting of claims 17-20 in independent form, pending a determination of patentability of base claim 10.

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Nonstatutory Double Patenting:

Claims 1-28 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-33 of copending Application No. 10/600,099 in view of Kersey et al. ("Novel Passive Phase Noise Cancelling Technique for Interferometric Fibre Optic Sensors", Electronic Letters, 05/10/90, vol. 26, no. 10, pgs. 640-641, IEEE, Stevenage, USA).

Applicant submits herewith an executed Terminal Disclaimer to Obviate A Double Patenting Rejection Over a Prior Application PTO/SB/25, citing U.S. Application No. 10/600,099 which is commonly-owned with the subject application.

Withdrawal of the nonstatutory double patenting rejection is therefore respectfully requested.

Specification Objections

The Office Action states:

The disclosure is objected to because of the following informalities: there is a blank line on page 1, line 10 of the specification that needs to be filled.

The amendments to the specification presented herewith address this point.

Withdrawal of the Specification Objection is therefore respectfully requested.

Claim Rejections - 35 U.S.C. § 103

Claims 1-5, 10-16, and 21-28 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hall (U.S. Patent No. 6,122,057; "Hall '057") in view of Kersey et al. ("Novel Passive Phase Noise Cancelling Technique for Interferometric Fibre Optic Sensors", Electronic

Letters, 05/10/90, vol. 26, no. 10, pgs. 640-641, IEEE, Stevenage, USA; "Kersey"). This rejection is respectfully, but most strenuously, traversed.

It is well-settled that there is no anticipation unless (1) all the same elements are (2) found in exactly the same situation and (3) are united in the same way to (4) perform the identical function. Since the Office Action's citations to each of the applied references is missing at least one element of each of applicant's independent claims, applicant respectfully submits that the claimed invention is not anticipated by the Office Action's citations to the applied references, as further discussed below.

For explanatory purposes, applicant discusses herein one or more differences between the Office Action's citations to the applied reference and the claimed invention with reference to one or more parts of the applied reference. This discussion, however, is in no way meant to acquiesce in any characterization that one or more parts of the Office Action's citations to the applied reference correspond to the claimed invention.

Applicant respectfully submits that the Office Action's citations to the applied reference does not teach or suggest one or more elements of the claimed invention. A careful reading of the Office Action's citations to the applied reference fails to teach or suggest, for example, calculating the phase angle  $\phi$  independently of the demodulation phase offset  $\beta$ , as recited in applicant's independent claim 1.

Hall '057 discloses:

A plot of these functions with modulation depth  $\beta$  set to 1.3 radians and period T set to 328 ns is shown in FIG. 2. (column 5, lines 45-46)

The modulation depth  $\beta$  has been set to the relatively small value of 1.3 radians to obtain the appropriate characteristics. For an external phase modulator

$$\beta = 2\pi\theta_p \left( \frac{\tau}{T} \right)$$

where  $\theta_p$  is the zero to peak phase shift for the modulator,  $\pi$  is the time delay for the mismatched interferometer sensor, and  $T$  is the period of the phase generated carrier... (column 6, lines 50-59)

Hall '057 discloses setting the modulation depth  $\beta$  to 1.3 radians to obtain appropriate characteristics. Hall '057 further discloses calculation of a phase angle  $\varphi$  (column 5, lines 9-10; equation (13)):

From Eqs. (9)-(12), the tangent of the phase change is calculated as

$$\tan \varphi = \left[ \frac{1}{R} \right] \left[ \frac{Q}{I} \right]$$

Referring to equations (9) and (10) of Hall '057,  $Q$  and  $I$  are calculated from  $S_1$ ,  $S_2$ ,  $S_3$ , and  $S_4$ , which are calculated by integrating  $e(t)$  and  $o(t)$  (column 4, lines 11-24; equations (5), (6), (7), and (8)):

Using capital letters to denote integrated outputs, we obtain

$$S_1 = A + E_1 \cos \phi + O_1 \sin \phi$$

and

$$S_3 = A + E_1 \cos \phi - O_1 \sin \phi$$

where  $S_1$  is the integrated output of  $s(t)$  and  $S_3$  is the integrated output of  $s\left\{t + (2n + 1)\frac{T}{2}\right\} \dots$

$$S_2 = A + E_2 \cos \phi + O_2 \sin \phi$$

and

$$S_4 = A + E_2 \cos \phi - O_2 \sin \phi.$$

Referring to equations (1)-(4) of Hall '057,  $s(t)$  and  $s\left\{t + (2n+1)\frac{T}{2}\right\}$  are calculated from

$e(t)$  and  $o(t)$ , which are calculated from  $\beta$ :

$$e(t) = b \cos\left\{\beta \sin 2\pi\left(\frac{t}{T}\right)\right\}$$

$$o(t) = b \sin\left\{\beta \sin 2\pi\left(\frac{t}{T}\right)\right\}$$

Hall '057 discloses calculation of the phase angle using equations that are dependent on the phase offset  $\beta$ . Simply missing from the Office Action's citation to Hall '057 is any mention of calculating the phase angle  $\phi$  independently of the demodulation phase offset  $\beta$ , as recited in applicant's independent claim 1.

So, the Office Action's citation to Hall '057 fails to satisfy at least one of the limitations recited in applicant's independent claim 1.

The shortcomings of the Office Action's citation to Hall '057 relative to certain elements of the claimed invention have been discussed above. The Office Action proposes a combination of the citation to Hall '057 with a citation to Kersey. However, the Office Action's citation to Kersey does not overcome the deficiency of the Office Action's citation to Hall '057. Applicant respectfully submits that the proposed combination of the Office Action's citation to Hall '057 with the Office Action's citation to Kersey fails to provide the required approach, assuming, *arguendo*, that the combination of the Office Action's citation to Hall '057 with the Office Action's citation to Kersey is proper.

Kersey (page 640, column 2, lines 15-18, 30-38) discloses:

It is possible to measure this phase noise by demodulation of the reference interferometer output, then electronically subtract this noise from the demodulated sensor output...

For a pair of interferometers with closely matched OPDs, the level of laser induced phase noise is equal in both interferometers, i.e.,  $\delta\phi_s = \delta\phi_r$ . It is cancelled from the sine and cosine dependent terms in the above signals. Subsequent DCM processing of  $S_a$  and  $S_b$  produces a output signal proportional to  $\phi_s - \phi_r$ , where  $\phi_s$  contains the 'signal' phase shift of interest. If the reference is well shielded from environmental noise,  $\phi_r$  contains only very low frequency drift information, and does not adversely affect the output.

Kersey discloses demodulation for noise cancellation. The Office Action's citation to Kersey fails to disclose calculating the phase angle  $\phi$  independently of the demodulation phase offset  $\beta$ . Simply missing from the Office Action's citation to Kersey is any mention of calculating the phase angle  $\phi$  independently of the demodulation phase offset  $\beta$ , as recited in applicant's independent claim 1.

Also, the Office Action (page 4) includes the following statement:

As for claims 22 and 23, while Kersey fails to disclose the specific type of filter used in the canceling technique, Official Notice is taken as to the well known use of low-pass and pole filters in demodulation, and it would have been obvious to one of ordinary skill in the art to use such filters to perform the phase noise canceling technique of Kersey prior to the phase angle calculations.

Assuming, *arguendo*, that this statement is correct, the statement nevertheless fails to teach or suggest the claimed approach.

So, the Office Action's citation to Kersey fails to satisfy at least one of the limitations recited in applicant's independent claim 1.

The Office Action's citations to Hall '057 and Kersey both fail to meet at least one of applicant's claimed features. For example, there is no teaching or suggestion in the Office Action's citations to Hall '057 or Kersey of calculating the phase angle  $\phi$  independently of the demodulation phase offset  $\beta$ , as recited in applicant's independent claim 1.

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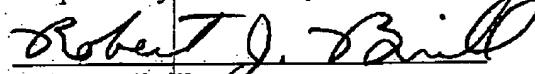
Furthermore, the Office Action does not allege that the art of record provides any teaching, suggestion, or incentive for modifying the citations to Hall '057 and/or Kersey to provide the claimed approach.

For all the reasons presented above with reference to claim 1, claims 1, 10, and 24 are believed neither anticipated nor obvious over the art of record. The corresponding dependent claims are believed allowable for the same reasons as independent claim 1, 10, and 24, as well as for their own additional characterizations.

Withdrawal of the § 103 rejection is therefore respectfully requested.

In view of the above amendments and remarks, allowance of all claims pending is respectfully requested. If a telephone conference would be of assistance in advancing the prosecution of this application, the Examiner is invited to call applicant's attorney.

Respectfully submitted,



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